Screening for High Blood Pressure

Recommendations and Rationale

U.S. Preventive Services Task Force

This statement summarizes the U.S. Preventive Services Task Force (USPSTF) recommendations on screening for high blood pressure and the supporting evidence,[1] and it updates the 1996 recommendations contained in the *Guide to Clinical Preventive Services*, second edition.[2] Explanations of the ratings and of the strength of overall evidence are given in Appendix A and in Appendix B, respectively. The complete information on which this statement is based, including evidence tables and references, is available in "Screening for High Blood Pressure: A Review of the Evidence for the U.S. Preventive Services Task Force." The recommendation statement and summary of the evidence can be obtained on the USPSTF Web site (http://www.preventiveservices.ahrq.gov) and through the National Guideline Clearinghouse™ (http://www.guideline.gov). They are also available from the AHRQ Publications Clearinghouse in print through subscription to the *Guide to Clinical Preventive Services, Third Edition: Periodic Updates.* To order, contact the Clearinghouse at 1-800-358-9295 or e-mail ahrqpubs@ahrq.gov.

The USPSTF recommendations are independent of the U.S. government. They do not represent the views of the Agency for Healthcare Research and Quality (AHRQ), the U.S. Department of Health and Human Services, or the U.S. Public Health Service.

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Summary of Recommendations

The U.S. Preventive Services Task Force (USPSTF) strongly recommends that clinicians screen adults aged 18 and older for high blood pressure. **A recommendation**.

The USPSTF found good evidence that blood pressure measurement can identify adults at increased risk for cardiovascular disease due to high blood pressure, and good evidence that treatment of high blood pressure substantially decreases the incidence of cardiovascular disease and causes few major harms. The USPSTF concludes the benefits of screening for, and treating, high blood pressure in adults substantially outweigh the harms.

The USPSTF concludes that the evidence is insufficient to recommend for or against routine screening for high blood pressure in children and adolescents to reduce the risk of cardiovascular disease. **I recommendation**.

The USPSTF found poor evidence that routine blood pressure measurement accurately identifies children and adolescents at increased risk for cardiovascular disease, and poor evidence to determine whether treatment of elevated blood pressure in children or adolescents decreases the incidence of cardiovascular disease. As a result, the USPSTF could not determine the balance of benefits and harms of routine screening for high blood pressure in children and adolescents.

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Clinical Considerations

- Office measurement of blood pressure is most commonly done with a sphygmomanometer. High blood pressure (hypertension) is usually defined in adults as a systolic blood pressure (SBP) of 140 mm Hg or higher, or a diastolic blood pressure (DBP) of 90 mm Hg or higher. Due to variability in individual blood pressure measurements (occurring as a result of instrument, observer, and patient factors), it is recommended that hypertension be diagnosed only after 2 or more elevated readings are obtained on at least 2 visits over a period of 1 to several weeks.
- There are some data to suggest that ambulatory blood pressure measurement (that provides a measure of the average blood pressure over 24 hours) may be a better predictor of clinical cardiovascular outcome than clinic-based approaches; however, ambulatory blood pressure measurement is subject to many of the same errors as office blood pressure measurement.
- The relationship between SBP and DBP and cardiovascular risk is continuous and graded. The actual level of blood pressure elevation should not be the sole factor in determining treatment. Clinicians should consider the patient's overall cardiovascular risk profile, including smoking, diabetes, abnormal blood lipids, age, sex, sedentary lifestyle, and obesity, in making treatment decisions.
- Hypertension in children has been defined as blood pressure above the 95th percentile for age, sex, and height. Up to 28% of children have secondary hypertension, ie, high blood pressure due to causes such as coarctation of the aorta, renal parenchymal disease, renal artery stenosis, and other congenital malformations. On the basis of expert opinion, several organizations, including the American Academy of Pediatrics (AAP), American Heart Association (AHA), and American Medical Association (AMA), recommend routine screening of asymptomatic adolescents and children during preventive care visits, based on the potential for identifying treatable causes of secondary hypertension, such as coarctation of aorta. However, there are limited data on the benefits or risks of screening and treating such underlying causes of hypertension in children. The decision to screen children and adolescents for hypertension remains a matter of clinical judgment.
- Evidence is lacking to recommend an optimal interval for screening adults for high blood pressure. The sixth report of the Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure (JNC 6) recommends screening every 2 years for persons with SBP and DBP below 130 mm Hg and 85 mm Hg, respectively, and more frequent intervals for screening those with blood pressure at higher levels.
- A variety of pharmacological agents are available to treat high blood pressure. JNC 6 guidelines for treatment of high blood pressure can be accessed at www.nhlbi.nih.gov/guidelines/hypertension/jncintro.htm. The JNC 6-recommended goal of treatment is to achieve and maintain SBP below 140 mm Hg and DBP below 90 mm Hg, and lower if tolerated. Evidence indicates that reducing DBP to below 80 mm Hg appears to be beneficial for patients with hypertension and diabetes. In considering the effectiveness of treatment for hypertension, it must be noted that a given treatment's ability to lower blood pressure may not correspond directly to its ability to reduce cardiovascular events.
- Nonpharmacological therapies, such as reducing dietary sodium intake, potassium supplementation, increased physical activity, weight loss, stress management, and reducing alcohol intake, are associated with a reduction in blood pressure, but their impact on cardiovascular outcomes has not been studied. For those who consume large amounts of alcohol (more than 20 drinks in a week), studies have shown that reduced drinking decreases blood pressure. There is insufficient evidence to recommend single or multiple interventions or to guide the clinician in selecting among nonpharmacological therapies.

Scientific Evidence

Epidemiology and Clinical Consequences

Hypertension is usually defined in adults as a SBP of 140 mm Hg or higher, or a DBP of 90 mm Hg or higher.[3] Data from the Third National Health and Nutrition Survey (NHANES III) suggest that an estimated 43 million American adults older than 25 have hypertension and that it is more common in African Americans and the elderly than in other groups. In the United States, hypertension is responsible for 35% of all myocardial infarctions and strokes, 49% of all episodes of heart failure, and 24% of all premature deaths.[4] Additional complications of hypertension include end-stage renal disease, retinopathy, and aortic aneurysm.[4–6]

In 1998, an estimated $109 billion was spent on the health care of patients with hypertension and its complications; $22 billion of this total was spent on the treatment of hypertension alone.[7]

Hypertension in children has been defined as blood pressure levels that are above the 95th percentile based on age, sex, and height-specific values derived from large cohort studies of children.[8] No studies have examined the association between elevated blood pressure in children and adolescents and the future risk for cardiovascular events. Prospective cohort studies have shown that, compared with children who have normal blood pressure, children who have hypertension are more likely to have high blood pressure as young adults.[9,10]

Among children with hypertension, the prevalence of secondary hypertension is estimated to be 28% compared with a prevalence of 1% to 5% in adults.[11] However, there are limited good data on the prevalence or incidence of treatable secondary causes of hypertension among children and adults in the primary care setting, and there are no population-level data available to estimate the true incidence or prevalence of secondary hypertension in adults or children.

Accuracy and Reliability of Screening Tests

Office blood pressure measurement (using an appropriate upper arm cuff with either mercury, calibrated aneroid, or validated electronic sphygmomanometer) is the standard screening test for hypertension. When performed correctly, sphygmomanometry provides a measure of blood pressure that is highly correlated with intra-arterial measurement and highly predictive of cardiovascular risk.[12] However, office blood pressure measurements exhibit great variability and may not represent the patient's usual blood pressure outside the clinical setting.

Ambulatory blood pressure monitoring provides a measure of average blood pressure over 24 hours as opposed to the isolated values obtained in office checks. Two recent reviews of good-quality cohort studies found that ambulatory blood pressure measurements correlate better with left ventricular mass and cardiovascular disease than do office blood pressure measurements.[13,14] Ambulatory blood pressure measurement was found to be a better predictor of clinical cardiovascular outcome than clinic-based approaches.[15–17] Another review found blood pressure measurements obtained through ambulatory devices more closely predictive of risk for target end organ damage than self- or office blood pressure measurements.[18]

Due to the limitations in the reliability of blood pressure measurements, experts commonly recommend that clinicians diagnose hypertension only after obtaining 2 or more elevated readings at 2 or more office visits at intervals of 1 to several weeks.[3,13]

Effectiveness of Early Treatment

Although no studies have examined the direct effect of screening for elevated blood pressure on clinical outcomes, many trials have demonstrated a beneficial effect of treating patients who were enrolled on the basis of elevated blood pressures detected during screening examinations. The risks associated with elevated blood pressure and the

potential benefits of screening and subsequent treatment depend both on the degree of blood pressure elevation and on the presence of other cardiovascular risk factors, such as age, sex, lipid disorders, smoking, and diabetes. Although the benefits of treatment generally correlate with achieving a decrease in blood pressure, recent trials suggest the degree of blood pressure reduction is not always a valid intermediate endpoint for predicting the benefits of treatment. One study showed that the 50% reduction in heart failure among patients receiving chlorthalidone compared with doxazosin could not be explained by the 2 mm Hg to 3 mm Hg difference in SBP between the 2 agents.[19]

Evidence is emerging that antihypertensive agents differ in efficacy in reducing future cardiovascular events. For example, one trial has shown that, for high-risk hypertensive patients, chlorthalidone (a diuretic) may be superior to amlodipine (a calcium-channel blocker) or lisinopril (an angiotensin-converting enzyme inhibitor).[20]

Several trials that examined the effectiveness of antihypertensive medications in adults with severe (Stage 3) hypertension suggest that treatment reduces the odds of congestive heart failure by 86%.[21] Among patients with mild to moderate elevations in blood pressure (Stages 1 and 2), treatment resulted in reduced rates of stroke among adults younger than 60. Patients older than 60 achieved further reductions in total mortality, including reductions in CVD death, stroke, coronary artery disease events, and congestive heart failure. A systematic review of 8 trials that examined the effects of treating isolated systolic hypertension in the elderly found that active treatment reduced both stroke and coronary heart disease events by 30%, CVD by 18%, and total mortality by 13%.[22] The number needed to treat over 5 years to prevent 1 cardiovascular event was 18 for men and 38 for women.

The relative benefit of treating high blood pressure appears similar across different levels of cardiovascular risk. As a result, individuals with higher absolute risk for experiencing future adverse cardiovascular events because of other coexisting risk factors experience greater absolute benefit from blood pressure reduction than those at lower risk for future adverse cardiovascular events. This benefit appears to hold true across all age groups and for reduction in both systolic and diastolic blood pressure.

The effect of more aggressive blood pressure treatment goals in patients within the general population has not been well studied. Patients with diabetes appear to derive additional benefit when blood pressure treatment goals are set below 140/90 mm Hg. In the United Kingdom Prospective Diabetes Study (UKPDS), patients with diabetes who were randomized to more aggressive blood pressure reduction (mean blood pressure of 144/82 mm Hg) were found to reduce the number of events of any diabetes-related clinical endpoint by 24% and to reduce diabetes-related deaths by 32%, compared with patients in the less aggressive reduction arm (mean blood pressure of 154/87).[23] Similar effects were observed in the Hypertension Optimal Treatment (HOT) Trial, which showed that more aggressive treatment of blood pressure in diabetic patients reduced major cardiovascular events by 49%.[24] The few trials that have examined the effect of aggressive blood pressure reduction in patients with renal insufficiency or renal failure found mixed results.

No studies have examined the effects of nonpharmacological therapies (eg, weight reduction, increased physical activity, sodium reduction, potassium supplementation, decreased alcohol intake, and stress management) on CVD events. A number of short-term randomized controlled trials (RCTs), however, have studied the effects of nonpharmacological therapies on blood pressure. A systematic review found that interventions to promote weight loss lowered blood pressure.[25] Evidence has also shown moderate physical activity to be more effective than vigorous activity in reducing SBP.[26] Several studies have demonstrated that reducing dietary sodium intake lowers blood pressure among people with hypertension.[27,28] In a systematic review of the effect of oral potassium supplementation on blood pressure, potassium supplementation (60 mmol or more) was estimated to lower SBP by 3.1 mm Hg and DBP by 2.0 mm Hg.[29] Among patients whose alcohol consumption is high (20 to 40 standard drinks per week), reducing alcohol consumption by at least 50% produced a

3.3 mm Hg reduction in SBP and 2.0 mm Hg reduction in DBP.[30] Evidence on the effects of stress management suggests stress reduction/relaxation and cognitive therapy-based interventions lower blood pressure. However, the actual benefit of stress management remains unclear because many of the trials included in the review were of only fair quality. Evidence is insufficient to determine the combined impact of multiple, simultaneous nonpharmacological interventions.

While no RCTs have examined the effects of pharmacological interventions on blood pressure in children, several uncontrolled short-term trials found that various agents could decrease blood pressure over several days to 4 weeks. No longer-term studies of the effects of medications in children are available. Few studies have evaluated the effects of nonpharmacological interventions in reducing elevated blood pressure in children.

Potential Harms of Screening and Treatment

Initially, some studies suggested that screening and labeling individuals with hypertension may result in adverse psychological effects and transient increases in absenteeism.[31–36] However, studies that have measured psychological well-being have found inconsistent effects of screening and diagnosis. Several cohort studies showed mixed effects on rates of absenteeism, and the causes of absenteeism were not well established.[36,37] In children, too few studies have examined the potential harms of screening to draw conclusions.

Potential adverse effects of drugs—some sufficiently bothersome to interfere with adherence to the medication regimen—are common, but serious adverse drug reactions are rare. Physicians should take adverse effects into consideration when deciding whether to treat and which treatment to use.

Recommendations of Others

Recommendations of the Joint National Committee (JNC) 6 call for routine blood pressure measurement at least once every 2 years for adults with a DBP below 85 mm Hg and a SBP below 130 mm Hg.[3] JNC-7 guidelines that update the JNC-6 guidelines for the treatment of high blood pressure can be accessed at www.nhlbi.nih.gov/guidelines/hypertension/jncintro.htm. Similar recommen-dations have been issued by the American Heart Association (AHA) for adults beginning at age 20.[38] The Canadian Task Force on Preventive Health Care is currently updating its recommendations on screening for elevated blood pressure. The American Academy of Family Physicians strongly recommends periodic measurement of blood pressure in patients older than 21.[39] The American College of Obstetricians and Gynecologists recommends measuring blood pressure annually or as appropriate for women 13 and older.[40] The American Academy of Pediatrics,[41] the National Heart, Lung, and Blood Institute,[42] the AHA,[43] Bright Futures: Guidelines for Health Supervision of Infants, Children and Adolescents,[44] and the American Medical Association[45] recommend regular blood pressure measurements starting at the age of 3 years. The AAP further recommends against universal neonatal blood pressure screenings.[46]

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Appendix A
U.S. Preventive Services Task Force—Recommendations and Ratings

The Task Force grades its recommendations according to one of 5 classifications (A, B, C, D, I) reflecting the strength of evidence and magnitude of net benefit (benefits minus harms):

A. The USPSTF strongly recommends that clinicians routinely provide [the service] to eligible patients. *The USPSTF found good evidence that [the service] improves important health outcomes and concludes that benefits substantially outweigh harms.*

B. The USPSTF recommends that clinicians routinely provide [the service] to eligible patients. *The USPSTF found at least fair evidence that [the service] improves important health outcomes and concludes that benefits outweigh harms.*

C. The USPSTF makes no recommendation for or against routine provision of [the service]. *The USPSTF found at least fair evidence that [the service] can improve health outcomes but concludes that the balance of benefits and harms is too close to justify a general recommendation.*

D. The USPSTF recommends against routinely providing [the service] to asymptomatic patients. *The USPSTF found at least fair evidence that [the service] is ineffective or that harms outweigh benefit*s.

I. The USPSTF concludes that the evidence is insufficient to recommend for or against routinely providing [the service]. *Evidence that [the service] is effective is lacking, of poor quality, or conflicting and the balance of benefits and harms cannot be determined.*

Appendix B
U.S. Preventive Services Task Force—Strength of Overall Evidence

The USPSTF grades the quality of the overall evidence for a service on a 3-point scale (good, fair, poor):

Good: Evidence includes consistent results from well-designed, well-conducted studies in representative populations that directly assess effects on health outcomes.

Fair: Evidence is sufficient to determine effects on health outcomes, but the strength of the evidence is limited by the number, quality, or consistency of the individual studies, generalizability to routine practice, or indirect nature of the evidence on health outcomes.

Poor: Evidence is insufficient to assess the effects on health outcomes because of limited number or power of studies, important flaws in their design or conduct, gaps in the chain of evidence, or lack of information on important health outcomes.

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